

6.0 AVOIDANCE, MINIMIZATION AND MITIGATIVE MEASURES

Pursuant to the CEQ regulations for implementing NEPA, environmental impact analyses must consider all relevant and reasonable measures to mitigate the potential adverse effects of proposed actions. The CEQ regulations define mitigation as the incorporation of measures through which the impacts of a proposed action are avoided, minimized, rectified, reduced/eliminated over time, or compensated for through resource replacement. This section describes conservation measures that would be implemented to avoid, minimize, rectify, reduce and compensate for the impacts of the proposed action; including measures incorporated into the project design, measures to mitigate potential impacts during project construction, and measures to detect and rectify potential post-construction project impacts.

The Applicant has completed an Inlet Management Plan (IMP) (Appendix C) that provides detailed information regarding required plan components including: (1) determination and type of data to define the baseline condition; (2) post-construction monitoring to compare baseline data and assess potential adverse impacts; (3) timeframes for post-construction monitoring; (4) identification of thresholds for implementation of mitigation measures; and (5) mitigation measures that may be implemented. Elements of this plan are discussed in Section 6.4 below.

6.1 Terminal Groin Design Features

As described in the Engineering Report (Appendix F), analyses of potential terminal groin designs considered functional shore protection performance as well as numerous environmental response parameters. Through several iterations of modeling analysis and adaptive redesign, functional and mitigative groin design features were refined to provide the optimal balance between functional efficiency and environmental impact avoidance and minimization. The majority of the mitigative features, which are common to both groin alternatives, are designed to minimize groin-related effects on hydrodynamic and sediment transport processes; thereby, in turn, avoiding adverse downdrift erosional effects on adjacent shorelines. The principal mitigative features are related to the permeability, profile, and length of the groin; as well as the performance of the associated sand fillet. The groin would be constructed of 4- to 5-ft-diameter granite armor stone; and unlike traditional jetties, would not have a core component of smaller diameter stone. The exclusive use of large armor stone would allow for groin construction to the design 25 percent void ratio, thus providing the “leaky” characteristic that allows sand to pass through the structure. The groin would also have a relatively low profile; thereby allowing sand to pass over the structure. The low profile is designed to allow overpassing even under eroded conditions at the end of each four-year nourishment cycle.

The initial nourishment event would include the construction of a wedged-shaped “groin fillet” sediment feature that would establish a gradual transitional shoreline between the western end of the beach fill footprint and the seaward terminus of the terminal groin, thereby minimizing the potential for adverse effects on longshore currents and sediment transport. Furthermore, both groin designs would extend the oceanfront shoreline seaward by only ~300 ft relative to the 2012 MHW line position, which is considerably less than the historical range of seaward shoreline positions associated with the eastern terminus of oceanfront project beach. Although the angle of the transitional shoreline would increase over time as the beach fill is eroded, erosion of the fillet would eventually subside as the sand trapping capacity of the groin and background shoreline erosion reach equilibrium, thereby maintaining a fillet through the end of each four-year nourishment interval. Initial construction of the terminal groin would include full construction of the fillet to the design sediment volume, thus limiting initial sand trapping and providing for immediate unimpeded longshore flow between the oceanfront shoreline and LFI.

6.2 Dredging Measures

Environmental Window

Dredging activities would adhere to a 16 November to 30 April environmental window; thereby avoiding peak estuarine-dependent fish and invertebrate larval ingress periods, peak benthic invertebrate recruitment periods, and periods when sea turtles and manatees are most likely to occur in project area waters.

Vessel Speed Restrictions

Hopper dredges would adhere to a speed limit of ten knots or less during transit between borrow sites and nearshore pump-out stations, thereby minimizing the risk of collisions with large whales.

Endangered Species Observers

During daylight hours (dawn to dusk), one NMFS-approved endangered species observer with at sea large whale identification experience would be onboard hopper dredges to conduct observations for large whales. If a right whale is sighted within 500 yards during active dredging, operations will cease until the observers are confident that the whale has left the area. If a whale is sighted during transit, the crew would reduce speed and alter course as necessary to maintain a distance of 500 yards between the vessel and the whale. All whale sightings would be documented and reported to the NMFS.

Inflow Screening

Hopper dredging contracts would require 100 percent inflow screening. The NMFS-approved endangered species observers would provide 100 percent (24 hours/day) monitoring of inflow screens, dragheads, and hoppers. During active dredging when dragheads are submerged, the NMFS-approved endangered species observers would continuously monitor (24 hours) the inflow screening for sturgeon and sea turtles. At the completion of each load cycle, dragheads would be physically inspected as they are lifted from the sea surface and placed on the saddle to account for sturgeon or turtles that may be impinged within the draghead. The dredge contractor would install lighting sufficient to illuminate the screens and draghead during nighttime hours.

Rigid Draghead Deflector

Rigid draghead deflectors would be required on all hopper dredges, thereby minimizing the risk of sea turtle and sturgeon entrainment. Dredging contracts would include specifications for the proper installation and operation of rigid dragheads to ensure effective mitigation of the entrainment risk.

Silent Inspector

The Silent Inspector automated dredging quality assurance monitoring system would be required on all hopper dredges. Data generated by the Silent Inspector would be used to monitor draghead performance and contractor compliance with other hopper dredge operational requirements, thereby minimizing the potential for sea turtle interactions and other potential impacts due to operator error.

Pipeline Inspections

Dredging contracts would require routine inspections of dredging equipment and sand delivery pipelines, thereby minimizing the potential for pressurized leaks and associated turbidity effects.

Pollution Prevention

Dredging contracts would require spill control plans and waste management plans for all dredging fleet equipment.

6.3 Beach Fill Placement Measures

Sediment Compatibility

All beach fill material would comply with the State of North Carolina Technical Standards for Beach Fill Projects (15A NCAC 07H .0312), thereby minimizing the extent and duration of potential beach fill placement impacts on terrestrial and marine habitats and biological communities. The Technical Standards require comparative analyses of recipient beach and proposed borrow site sediments; including quantitative analyses of percent weight of fine-grained sediment, percent weight of granular sediment, percent weight of gravel, and percent weight of calcium carbonate. As previously described, analyses have shown that sediments associated with the preferred and potential supplemental borrow sites are compatible according to the state standards. Continuous visual monitoring of fill material would be conducted at the pipeline outfall before it is redistributed along the beach. If noticeable quantities of incompatible fill material are detected, the contractor will cease operations and immediately contact the Wilmington District Regulatory Branch and NCDRCM to determine the appropriate course of corrective action.

Environmental Window

Terminal groin construction and beach fill placement activities would adhere to a 16 November to 30 April environmental window; thereby avoiding the sea turtle nesting season, the majority of the shorebird breeding season, the majority of the seabeach amaranth growing season, and peak benthic invertebrate recruitment periods.

Escarpment Monitoring

Immediately after the beach construction operation is complete and prior to 1 May, surveys for escarpments will be conducted within the limits of the construction area. Escarpments that are identified prior to or during the nesting season that interfere with sea turtle nesting (exceed 18 inches in height for a distance of 100 feet) would be leveled to the natural beach profile. If it is determined that escarpment leveling is required during the nesting or hatching season, leveling actions would be coordinated with the USFWS.

Water Quality

Dredging contracts would require the use of spreaders on pipelines to reduce effluent discharge velocities during sand-slurry placement. Temporary longitudinal sand dikes would be used to contain and direct the horizontal flow of the discharged sand-slurry along the beach. These measures would maximize sediment retention within the designated placement area, thereby minimizing potential surf zone turbidity effects.

Shielded Lighting

Directional, shielded, and low intensity lighting would be employed to minimize the potential effects of artificial nighttime lighting on marine organisms.

Staging Areas and Beach Access

The staging area and refueling location for construction equipment (bulldozers, frontend loaders, pickups, etc.) would be located off the beach at the existing East End public access parking lot. Construction equipment would access the beach via the existing public access corridor. During nighttime hours, idle construction equipment would be stored off the beach to the extent practicable. Heavy equipment would be removed from refurbished shorelines as soon as practicable, restoring unrestricted public access.

Pipeline Inspections

Beach fill placement contracts would require routine inspections of sand delivery pipelines, thereby minimizing the potential for pressurized leaks along the beachfront.

Pollution Prevention

Beach fill placement contracts would require spill control plans and waste management plans for all construction equipment.

Nourishment Frequency

Nourishment frequency is proposed for every four years which is a reduction from current practices of beneficial beach placement every two years.

6.4 Inlet Management Plan

Pursuant to the NC Coastal Policy Reform Act of 2013, proposals to construct terminal groins must incorporate a plan for management of the associated inlet, as well as the immediately adjacent estuarine and ocean shorelines that are under the influence of the inlet. Specifically, IMPs must: 1) describe post-construction activities that will be undertaken to monitor groin-related impacts, 2) define the baseline for assessing impacts and the thresholds that will trigger mitigation, 3) provide for the implementation of mitigation measures in the event that thresholds are reached, and 4) provide for the modification or removal of the groin in the event that impacts cannot be otherwise mitigated. This section presents an overview of the Applicant's proposal to monitor and mitigate potential groin-related impacts in accordance with the Coastal Policy Reform Act. Further detail can be found in the Applicant's Draft IMP (Appendix C).

As part of its ongoing beach management program, the Town has conducted annual topographic/bathymetric profile surveys of the Holden Beach oceanfront and inlet shorelines since 2000. Beginning in 2012, the inlet and adjoining oceanfront shorelines on Oak Island were added to the Town's annual monitoring program. Annual surveys consist of conventional and hydrographic survey data collection along permanent shore-perpendicular transects extending from the primary dune out to a depth of at least -25 ft NAVD88. The proposed terminal groin monitoring program would utilize 16 of the existing transects to document shoreline profile changes. An additional survey grid encompassing the flood shoal to wading depth would be established at a maximum grid spacing of 25 ft. Monitoring of the existing transects and flood shoal grid would include pre-project and immediate post-construction surveys, biannual surveys during the initial five-year post-construction period, and annual surveys thereafter. Additional bathymetric survey data covering the AIWW crossing, bend-widener, and LFI channel would be acquired from the USACE, which typically surveys these areas several times a year. However, in the event that USACE surveys have not occurred within the previous four months, annual monitoring efforts by the town will incorporate hydrographic surveys of these areas. Aerial photographs of the study area that include the survey transects will be obtained biannually during the initial two-year post-construction period and annually during years three through five. At the end of the initial five-year post-construction period, the applicant will coordinate with regulatory agencies to determine the need for additional annual aerial photography. During the initial two-year post-construction period, surficial beach sediment samples will be collected along two project area transects and three control transects located outside of the project footprint. Samples at each of these transect profiles will be collected at three cross-shore locations corresponding approximately to the +6 ft, +3 ft, and -3 ft NAVD88 elevation contours. Sediment samples will be analyzed using standard ASTM procedures for grain size distribution, percent fines, color, and visually for shell content.

Monitoring data will be analyzed to determine sediment volume and shoreline position changes within the project area. At a minimum, the following analyses will be performed:

- Beach Profile Comparison Plots: The current survey for each profile will be graphically compared to the previous survey(s).
- Shoreline Change Analysis: The shoreline (typically the mean high water line) positions between consecutive surveys will be compared, plotted, and analyzed for mean and extreme changes.
- Volume Change Analysis: Project placement volumes will be compared with volume remaining in the active profile at the time of each survey. Estimates of cross-shore and longshore sediment volume changes will be calculated and compared with the results of each subsequent survey, to the extent possible.

- Sediment Grain Size Distribution: Sediment samples will be analyzed and compared to the composite mean grain size of the native beach material.
- Storm Events: Any significant storm events that affect the project beach will be described based on available local meteorological data.
- Performance Assessment: Overall project performance will be assessed based on the design goals and current state of the project.

The Draft IMP (Appendix C) establishes a volumetric shoreline erosion rate mitigation threshold based on analyses of observed annual volumetric changes from 2000 through 2012. Exceedance of the established threshold as described in Appendix C (IMP) would trigger a requirement to implement mitigative action. If monitoring data indicate an exceedance of a threshold, the Town proposes that a Technical Advisory Committee (TAC) be formed and consulted. The proposed TAC would be comprised of a NC licensed professional engineer with substantial experience in coastal engineering from the Town, Oak Island and the USACE (or mutually agreed upon independent engineer). The TAC will review the results of the monitoring data and analyses and consider whether there are any terminal groin related impacts causing or contributing to the threshold exceedance. The TAC is proposed to be formally established prior to the completion of the construction of the terminal groin project.

If the majority of the TAC determines that an exceedance exists as a result of the terminal groin, and not as a result of other causes, the Town would work with the TAC and affected parties to determine and implement appropriate mitigation measures consistent with applicable law. Mitigation measures may include renourishment of the affected beach, groin modification (reconfiguration, notching, or shortening), or complete groin removal. As previously described, a base layer of geo-textile matting installed below grade would prevent settlement of the armor stone and facilitate modification or removal of the groin. Furthermore, the relatively short length of the groin and the local tidal range would allow for modifications or removal of the groin from shore using conventional heavy construction equipment. The town has independently maintained a consistent source of funding for beach management activities [i.e., Beach, Parks, Access and Recreation/Tourism Fund (BPART)]. The BPART, which has consistently financed nourishment and other beach management projects over the past decade, would provide funding for any required mitigation.

6.5 Conservation Measures

To reduce the potential impacts of the proposed project on federally-listed species, the Applicant has proposed the following Conservation Measures:

Conservation Measures - Loggerhead, Leatherback, and Green Sea Turtles

1. Only beach quality sand suitable for sea turtle nesting, successful incubation, and hatchling emergence shall be used for beach nourishment at the project site. Furthermore, sand of similar grain size and composition to that of the existing beach will be used to reduce any changes in physical characteristics of the beach that may affect nest survival. This material will meet the Technical Standards for Beach Fill Projects as published in the NCAC (15A NCAC 07H .03t2).
2. The Town will ensure that contractors performing the beach nourishment and dredging work fully understand sea turtle protection measures.
3. Intensive sea turtle nest monitoring will be performed by qualified personnel of the Holden Beach Volunteer Sea Turtle Monitoring Group within and immediately adjacent to the Project Area. The monitoring will be performed throughout the portion of the construction time period and will include the following elements:
 - Monitoring within the work areas will be performed at night in a regular, routine fashion by qualified sea turtle monitoring personnel;
 - Any nesting sea turtle encountered by sea turtle monitoring volunteers will be tagged per standard operating procedures;
 - These nests will be relocated to more stable, suitable nesting habitat located further west to ensure that no sea turtle nests are impacted from construction activities;
 - For any nests that have not been relocated, monitoring for emerging nests or hatchlings shall be conducted prior to initiating work and regularly thereafter;
 - If nest or hatchlings are within an area obstructed by equipment or nourishment activities, hatchlings will be transported by qualified personnel to an area outside of the work boundaries. The hatchlings will be released at least five feet above the current water line and allowed to crawl into the ocean;
 - Construction is planned to be completed by April 30;
 - Immediately after completion of this project and prior to May 1 for one subsequent year, sand compaction will be monitored in the area of restoration in accordance with the USFWS. If required, the area will be tilled to a depth of 36 inches. All tilling activity shall be completed prior to May 1. A report on the results of compaction monitoring will be submitted to the USFWS prior to any tilling actions being taken. An annual summary of compaction assessments and the actions taken will be submitted to the USFWS;
 - Visual surveys for escarpments along the Project Area shall be made immediately after completion of the beach nourishment project and prior to May 1 for one subsequent year. Results of the surveys will be submitted to the USFWS prior to any action being taken. Escarpments that interfere with sea turtle nesting or that exceed 18 inches in height for a distance of 100 ft will be leveled to the natural beach contour by May 1;
 - An annual summary of escarpment surveys and actions taken will be submitted to the USFWS;

- Staging areas for construction equipment will be located as far landward as possible without compromising the integrity of the dune system. Temporary storage of construction materials on the beach will be in such a manner so as not to compromise the integrity of the dune systems;
- To the maximum extent practicable, all excavations and temporary alteration of beach topography resulting from groin construction will be filled or leveled to the natural beach profile prior to dusk each day. During any periods when excavated trenches must remain on the beach at night above MHW, a barrier (e.g., hay bales, silt fencing) sufficient to prevent adult and hatchling sea turtles from accessing excavated trenches, etc., would be placed around the footprint of each groin segment;
- The Town will seek to perform any dredging associated with the terminal groin fillet construction or maintenance, outside of the sea turtle moratorium - unless necessitated by an emergency condition;
- The Town will limit all terminal groin construction activities to daylight hours only;
- The Contractor will not utilize beach or structure lighting within the May 1 through November 30 timeframe except as may be required by the USCG for purposes of ensuring public safety.

Conservation Measures - Piping Plover and Red Knot

1. A specific construction corridor for the terminal groin will be established. This will provide readily available substitute habitat areas for any birds displaced by construction activities.
2. To reduce changes in physical characteristics of the beach that may affect nourishment impacts on invertebrates, sand of similar grain size to the existing beach will be used.
3. Although the direct footprint of the terminal groin may result in a permanent loss of foraging habitat, beach nourishment and groin construction would occur within highly eroded areas and would ultimately increase foraging habitat within the Project Area.
4. The Town of Oak Island is currently conducting shorebird monitoring for the Lockwoods Folly River Habitat Restoration Project, Phase I – Eastern Channel (Figure 6.1). The areas monitored include the East End of Holden Beach and this data will be used to evaluate potential impacts of the proposed project. Appendix P includes the Bird Monitoring Plan describing methodology and reporting.

Conservation Measures - Seabeach Amaranth

1. Beach placement and fillet formation would take place after November 15th, after amaranth plants have already released seeds.



Figure 6.1. Bird Monitoring Plan for the Lockwoods Folly River Habitat Restoration Project, Phase I – Eastern Channel

Conservation Measures - West Indian Manatee

1. Proposed excavation work would be performed with a cutter suction dredge with sand pumped by submerged pipeline to the eastern end of Holden Beach.
2. Groin construction would be spatially constrained to reduce the possibility of a collision.
3. The majority of the dredging would occur during fall and winter months when populations of manatees are lower.
4. The contractor will follow the USFWS's Guidelines for Avoiding Impacts to the West Indian Manatee: Precautionary Measures for Construction Activities in North Carolina Waters.